CLAIMS

1. A seal ring back-up device, comprising:

an annular body having a top surface, a bottom surface opposite the top surface, an inner surface, and an outer surface opposite the inner surface, wherein the inner surface exhibits an inner diameter of the annular body and the outer surface exhibits an outer diameter of the annular body; and

a scarf cut defined in the annular body and extending between the inner and outer surfaces at an angle relative to the top surface, wherein the annular body is arrangeable within a gland and the top surface is engageable with a seal ring,

wherein the top surface comprises a surface contour shape selected from the group consisting of convex, concave, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

2. The seal ring back-up device of claim 1, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface.

3. The seal ring back-up device of claim 1, wherein the bottom surface is wedge shaped.

4. The seal ring back-up device of claim 1, wherein the surface contour shape is concave to receive the seal ring.

5. The seal ring back-up device of claim 1, wherein the annular body comprises a material selected from the group consisting of a metal, a metal alloy, a plastic, an amorphous polymer, glass, clay, ceramic, a thermoset, an epoxy, silica, carbon black, carbon fibers, nanoclay, nanotubes, boron, and any combination thereof.

6. The seal ring back-up device of claim 1, wherein the annular body comprises a material selected from the group consisting of polyphenylene sulfide, polyaryletherketone, an amorphous polymer, a polyimide, a polyamide, a sulfone, any derivative thereof, and any combination thereof.

7. The seal ring back-up device of claim 1, further comprising a surface coating disposed on the annular body, the surface coating being selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.

8. A sealing system, comprising:

a bore;

a piston extendable within the bore and thereby defining an extrusion gap between the bore and the piston;

a gland defined in at least one of the bore and the piston and providing a wall;

a seal ring arranged within the gland; and

a seal ring back-up device arranged within the gland in direct contact with the seal ring and providing an annular body having a top surface engageable with the seal ring, a bottom surface opposite the top surface and engageable with the wall, an inner surface, and an outer surface opposite the inner surface,

wherein a scarf cut is defined through the annular body and extends between the inner and outer surfaces at an angle relative to the top surface.

9. The sealing system of claim 8, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, the opposing sloped faces being slidingly engageable with one another during operation.

10. The sealing system of claim 8, wherein the bottom surface and the wall are each wedge shaped.

11. The sealing system of claim 8, wherein the top surface comprises a surface contour shape selected from the group consisting of flat, convex, concave, angled, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

12. The sealing system of claim 8, wherein the annular body comprises a material selected from the group consisting of a metal, a metal alloy, a plastic, an amorphous polymer, glass, clay, ceramic, a thermoset, an epoxy, silica, carbon black, carbon fibers, nanoclay, nanotubes, boron, polyphenylene sulfide, polyaryletherketone, an amorphous polymer, a polyimide, a polyamide, a sulfone, any derivative thereof, and any combination thereof.

13. The sealing system of claim 8, further comprising a surface coating disposed on the annular body, the surface coating being selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.

14. The sealing system of claim 8, wherein the seal ring is bonded to the seal ring back-up device.

15. A method, comprising:

arranging a seal ring within a gland defined within one of a bore and a piston, the piston being extendable within the bore and thereby defining an extrusion gap between the bore and the piston;

arranging a seal ring back-up device within the gland and in direct contact with the seal ring, the seal ring back-up device providing an annular body having a top surface, a bottom surface opposite the top surface, an inner surface, and an outer surface opposite the inner surface, wherein a scarf cut is defined in the annular body and extends between the inner and outer surfaces at an angle relative to the top surface;

forcing the seal ring against the top surface as an external pressure increases and thereby forcing the bottom surface against a wall defined in the gland; and

closing the extrusion gap with the seal ring back-up device as the bottom surface is forced against the wall defined and thereby preventing the seal ring from deforming into the extrusion gap.

16. The method of claim 15, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, and wherein arranging the seal ring back-up device within the gland comprises:

separating the opposing sloped faces to increase an inner diameter of the seal ring back-up device; and

extending the piston through the seal ring back-up device until the seal ring back-up device locates the gland.

17. The method of claim 15, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, and wherein closing the extrusion gap with the seal ring back-up device comprises slidingly engaging the opposing sloped faces on one another.

18. The method system of claim 15, wherein the bottom surface and the wall are each wedge shaped and forcing the bottom surface against the wall comprises slidingly engaging the bottom surface against the wall.

19. The method of claim 15, wherein forcing the seal ring against the top surface comprises forcing the seal ring against a surface contour shape provided on the top surface, the surface contour shape being selected from the group consisting of flat, convex, concave, angled, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

20. The method of claim 15, wherein arranging the seal ring back-up device within the gland is preceded by coating the annular body with a surface coating selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.

CLAIMS

1. A seal ring back-up device, comprising:

A solitary annular body having a top surface, a bottom surface opposite the top surface, an inner surface, and an outer surface opposite the inner surface, wherein the inner surface defines an inner diameter of the annular body and the outer surface defines an outer diameter of the annular body; and

a scarf cut extending between the inner and outer surfaces of the annular body and defining a gap in the annular body that extends completely between the top surface and the bottom surface, the gap being defined at an angle relative to the top surface,

wherein the annular body is arrangeable within a gland and the top surface is directly engageable with a seal ring, and

wherein the top surface comprises a surface contour shape selected from the group consisting of convex, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

2. The seal ring back-up device of claim 1, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface.

3. The seal ring back-up device of claim 1, wherein the bottom surface is wedge shaped.

4. The seal ring back-up device of claim 1, wherein the surface contour shape is concave to receive the seal ring.

5. The seal ring back-up device of claim 1, wherein the annular body comprises a material selected from the group consisting of a metal, a metal alloy, a plastic, an amorphous polymer, glass, clay, ceramic, a thermoset, an epoxy, silica, carbon black, carbon fibers, nanoclay, nanotubes, boron, and any combination thereof.

6. The seal ring back-up device of claim 1, wherein the annular body comprises a material selected from the group consisting of polyphenylene sulfide, polyaryletherketone, an amorphous polymer, a polyimide, a polyamide, a sulfone, any derivative thereof, and any combination thereof.

7. The seal ring back-up device of claim 1, further comprising a surface coating disposed on the annular body, the surface coating being selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.

8. A sealing system, comprising:

a bore;

a piston extendable within the bore and thereby defining an extrusion gap between the bore and the piston;

a gland defined in at least one of the bore and the piston and providing a wall;

a seal ring arranged within the gland; and in direct contact with the seal ring, the seal ring back-up device comprising:

a solitary annnular body having a top surface, engageable with the seal ring, a bottom surface opposite the top surface, and engageable with the wall, an inner surface, and an outer surface opposite the inner surface; and

a scarf cut extending between the inner and outer surfaces of the annular body and defining a gap in the annular body that extends completely between the top surface and the bottom surface, the gap being defined at an angle relative to the top surface.

9. The sealing system of claim 8, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, the opposing sloped faces being slidingly engageable with one another during operation.

10. The sealing system of claim 8, wherein the bottom surface and the wall are each wedge shaped.

11. The sealing system of claim 8, wherein the top surface comprises a surface contour shape selected from the group consisting of flat, convex, concave, angled, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

12. The sealing system of claim 8, wherein the annular body comprises a material selected from the group consisting of a metal, a metal alloy, a plastic, an amorphous polymer, glass, clay, ceramic, a thermoset, an epoxy, silica, carbon black, carbon fibers, nanoclay, nanotubes, boron, polyphenylene sulfide, polyaryletherketone, an amorphous polymer, a polyimide, a polyamide, a sulfone, any derivative thereof, and any combination thereof.

13. The sealing system of claim 8, further comprising a surface coating disposed on the annular body, the surface coating being selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.

14. The sealing system of claim 8, wherein the seal ring is bonded to the seal ring back-up device.

15. A method, comprising:

arranging a seal ring within a gland defined within one of a bore and a piston, the piston being extendable within the bore and thereby defining an extrusion gap between the bore and the piston;

arranging a seal ring back-up device within the gland and in direct contact with the seal ring, the seal ring back-up device comprising

a solitary annular body having a top surface, a bottom surface opposite the top surface, an

inner surface, and an outer surface opposite the inner surface, and

a scarf cut extending between the inner and outer surfaces of the annular body and defining a gap in the annular body that extends completely between the top surface and the bottom surface, the gap being defined at an angle relative to the top surface;

forcing the seal ring against the top surface as an external pressure increases and thereby forcing the bottom surface against a wall defined in the gland; and

closing the extrusion gap with the seal ring back-up device as the bottom surface is forced against the wall defined and thereby preventing the seal ring from deforming into the extrusion gap.

16. The method of claim 15, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, and wherein arranging the seal ring back-up device within the gland comprises:

separating the opposing sloped faces to increase an inner diameter of the seal ring back-up device; and

extending the piston through the seal ring back-up device until the seal ring back-up device locates the gland.

17. The method of claim 15, wherein the scarf cut provides opposing sloped faces each angled at the angle relative to the top surface, and wherein closing the extrusion gap with the seal ring back-up device comprises slidingly engaging the opposing sloped faces on one another.

18. The method system of claim 15, wherein the bottom surface and the wall are each wedge shaped and forcing the bottom surface against the wall comprises slidingly engaging the bottom surface against the wall.

19. The method of claim 15, wherein forcing the seal ring against the top surface comprises forcing the seal ring against a surface contour shape provided on the top surface, the surface contour shape being selected from the group consisting of flat, convex, concave, angled, stepped at the outer surface, chamfered at the outer surface, and any combination thereof.

20. The method of claim 15, wherein arranging the seal ring back-up device within the gland is preceded by coating the annular body with a surface coating selected from the group consisting of a corrosion inhibitor, a corrosion resistant material, a friction reducer, a wear reducer, ceramic, and any combination thereof.